

# South Asia

Financial year	Regional expenditure	Percentage of total bilateral expenditure	Board target as percentage of expenditure
2002–03	\$3 593 919	13.5%	10–20%
2001–02	\$3 004 923	12.3%	10–20%
2000–01	\$3 955 937	15.8%	10–20%

ACIAR’s South Asia program expenditure has remained within the Board’s defined target levels, with a slight dip in 2001–02. India remains the main focus, with small programs in some countries that are centred on one or two projects, having minor adjustments in overall expenditure.



*Vicki Poole manages our South Asia Program*

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Garole sheep, Maharashtra, India

# India

Active projects in 2002–03	29
Bilateral country expenditure in 2002–03	\$2 398 203
Bilateral country expenditure in 2001–02	\$2 080 586
Bilateral country expenditure in 2000–01	\$2 980 463

## Position

ACIAR engages mainly with centres in north and central India, where research projects are presently underway to manage scarce water and nutrient resources more efficiently, improve yield and quality of grains and legumes, and diversify production and raise farm incomes. Recent research has assisted in adoption of minimal tillage approaches in rice–wheat farming systems, with significant benefits for moisture conservation and weed management in crops. India has a large and well-developed national agricultural research system that has collaborated strongly in ACIAR projects. Additional linkages with groups such as State Agricultural Universities, the National Dairy Development Board and technical NGOs have facilitated technology development and the delivery of benefits.

## Achievements

Sustainable crop production and management is a central theme of ACIAR’s activities in India. Determining environmental characteristics of waterlogging prone environments is essential for providing clues to improved cereal crop varieties and management. Results demonstrated that may be waterlogged after irrigation and drainage soils even though there is no water showing at the soil surface. This can significantly limit crop production. Identification of physiological traits indicates that ‘recovery ability’ accounts for 70–75 per cent of variation in waterlogging tolerance. Methods have now been established to evaluate soil recovery ability following waterlogging. **Waterlogging-tolerant wheat varieties** have been identified for sodic and for neutral soils. Management techniques developed for sowing wheat in rice–wheat rotations at the end of the rice season should also reduce yield losses from subsequent heat stresses and drought.

**Permanent raised beds for rice–wheat rotations** continue to show promise in India. Research in one project has shown that, with the exception of rice, crops do as well or better on beds compared to the flat. Part of this project has been looking at methods of direct zero-till seeding of wheat into the heavy straw residues. The ‘Happy Seeder’ is a unique tillage machine, developed by CSIRO and the Punjab Agricultural University, that allows seed to be planted under straw deposits without permanently removing the straw. Experiments in 2002–03 showed that wheat could emerge through up to 8 tonnes per hectare of rice straw and yield normally. The potential role of the high vigour lines of wheat, developed in an ACIAR project examining integrated management

Controlling *Phalaris minor* in the Indian rice–wheat belt



options for herbicide resistant weeds of wheat, has been recognised by the Grains Research and Development Corporation (GRDC). Funding has been allocated by the GRDC for the next 5 years to use the elite weed-suppressive material for developing weed-competitive wheats for Australia. A thorough survey of use of manure by villages revealed that the 50 per cent of farmers with the smallest holdings get more crop nutrients from farmyard manure than they do from fertiliser. A workshop to disseminate the results was held in February, 2003.

More than 50 Indian and Nepalese scientists received training in a comprehensive package covering the major issues in the design and analysis of quantitative field experiments as part of a project on improving chickpea in drought-prone environments. **Chickpea lines** derived from a cross made earlier in the project are being **field-tested for their compatibility to local conditions in India and Australia**. A project on improving subtropical citrus production in Sikkim has germinated an extensive range of citrus lines supplied as seed from Australia. These trees will be used in scion (grafting) and rootstock experiments at various sites throughout the citrus-growing regions of Sikkim.

Drought and climate variability play a significant role in cropping in India, as they do in Australia. Long-term climate data for breeding centres and major peanut growing regions in India involved in a project on **breeding drought-resistant peanuts**, are being collated to define a range of environments. This information allows breeding programs to apply selection parameters based on the predominant drought pattern for a given environment. A number of elite drought-tolerant genotypes generated from the project are being evaluated. A separate project looking at improving seasonal climate forecasting ran a workshop in September 2002 to inform on progress. A publication *Will it rain, India?*, based on the successful Indonesian version outlining factors in seasonal climate forecasting, including the effects of El Niño and the southern oscillation, is in development.

A project to integrate technologies to help assess **the extent and cause of degradation in arid areas** has established a remote sensing laboratory at the Central Arid Zone Research Institute and acquired equipment, software and imagery. Determining if the degradation is caused by natural elements or land-use patterns is vital to effective land management. Indian scientists have been trained in field methodology, use of equipment, data analysis and image processing and interpretation. A project looking at institutional change to improve water policy and management of scarce Indian water resources held its first workshop, attended by researchers interested in the issue as well as practitioners involved with Australian water arrangements.

Livestock productivity improvements including through better feeds are very important in Indian agriculture, particularly for poor smallholder farmers. Dairying is the sole source of income for about 11 million



*Indian tillage machine*



*Farming for vegetables in the Punjab*



farming families in India. ACIAR-funded project work has developed an **oilseed-based protein meal supplement that significantly increases milk production**, fat and protein yield in cows and buffaloes. Economic benefits of the increased production have been estimated at an additional Rs10 (\$A0.32) per animal per day, potentially a significant additional income source to farmers. A semi-commercial plant capable of producing up to 50 tonnes per day of protein meal was opened in September 2002 by Her Excellency Penny Wensley, the Australian High Commissioner to India, and Chairman of the National Dairy Board of India, Dr Amrita Patel. The basis of prolificacy in the Garole breed of sheep has been identified as a single gene – the Booroola mutation. The Garole is the only genuinely prolific sheep breed in India, making the identification of the gene an important step in improving sheep production in Maharashtra. The mutation ensures a higher level of multiple births in the Garole breed.

A pioneering pilot trial on the **suitability of stylo leaf meal as a component of poultry rations** has been completed at one of the largest commercial poultry integrators in India. Initial results have demonstrated increased feed intake and daily weight gain but with slightly increased feed conversion ratio and cost. The leaves are derived from improved stylosanthes that are higher yielding and resistant to anthracnose. These have been distributed to a small group of farmers as part of initial extension activities associated with the project.

Under **the multi-country shrimp virus project**, previously identified best management practices focussing on white spot disease control in shrimp were implemented on participating aquaculture farms. Although there were some disease outbreaks, demonstration ponds had significantly better performance compared to the same ponds in 2001 and nearby non-demonstration ponds during 2002.

**Eucalypt plantations** in southern India are significantly less productive than elsewhere. Through a project located in Kerala State, practices for manipulating soil organic matter and to determine soil and tree nutrient and water status in eucalypt plantations have been developed. Silvicultural regimes that optimise conservation and use of site resources, and enable increased and sustainable wood production from eucalypt plantations, have been implemented. The project has gathered much practical information on fertiliser use, weed control and ground cover planting. The research has produced a better understanding of the dynamics of fertiliser response, including the role of soil organic matter in nutrient cycling. Soil management prescriptions are now being adopted by the State Forestry Department and smallholders. As well as suffering from poor nutritional management practices, the eucalypt plantations in much of India are grown from seed of sub-optimal genetic quality. Simple selection and breeding programs have been developed for several Australian species, and improved seed of eucalyptus and acacia species from seed orchards established under the project in southern India is now starting to be distributed widely.

A review of the existing system of **food safety standards** and quality control in India and Thailand was undertaken, with emphasis on the **compatibility of the system with WTO commitments**. The review is aimed at helping facilitate trade while legitimately protecting the health and safety of consumers. Two workshops have been run on the project over the last year.

Research into reducing the harmful environmental impacts of **wool scouring effluent** has resulted in compulsory procedures being put in place for wool mills involved in scouring. The procedures focus on identifying environmental impacts and utilise audits developed during the project. As in China, links between profitable operating procedures and reductions in effluent discharge were identified.



*Farming in Goa*



*Inland saline fishpond in Haryana, India*



*Tannery project*



# Pakistan

Active projects in 2002–03	5
Bilateral country expenditure in 2002–03	\$212 104
Bilateral country expenditure in 2001–02	\$211 617
Bilateral country expenditure in 2000–01	\$216 019

## Position

Past projects have emphasised management of irrigation and drainage, and management of agriculture and forestry on saline soils within a broader focus on overcoming biotic and abiotic constraints in broadacre crop production. Since late 2001, security considerations have hindered the development of further project work in Pakistan.

## Achievements

Pakistan is a water-deficient country and needs to maintain the quantity and quality of its water resources to keep pace with the rapid population growth. Conjunctive management of all water resources relies on knowledge of the systems and management techniques. Staff from the Centre of Excellence in Water Resources, Lahore, Water and Power Development Authority, the International Water Management Institute (IWMI) and private consultants have received hands-on GIS and modelling training leading to new knowledge, models and databases for the conjunctive management of water resources in Pakistan.

**Growing maize and wheat on permanent beds has improved yields despite the reduced use of water.** During the project's four years of experimentation summer maize yields on beds yielded 54 per cent higher than on the flat while using 33 per cent less irrigation water. For wheat grown on raised beds yields over a three-year period were only three per cent above those on the flat, but 37 per cent less water was used. Nearby farmers who have adopted raised beds are achieving similar efficiency gains with the new system. Research to better understand the Gemini virus diseases of cotton and tomato through molecular characterisation of these viruses is underway. The studies are leading to a better understanding of the nature of crop plant resistance, which will help in the development of effective management techniques.



Buffalo grazing on kellar grass  
- irrigated saline soil



Measuring soil salinity



Grazing on saltbush

# Other South Asian countries

## Afghanistan

Active projects in 2002–03	1
Bilateral country expenditure in 2002–03	\$0*
Bilateral country expenditure in 2001–02	0
Bilateral country expenditure in 2000–01	0

\* \$650 000 in multilateral funding

### Position

Two decades of war coupled with the worst drought in 40 years have devastated Afghanistan's food-production capabilities and depleted critical seed stocks, leaving the nation heavily dependent on food aid from international donors. ACIAR's multilateral project in Afghanistan provides short-term support to wheat and maize production, wheat being by far the most important crop and maize the third most important.

### Achievements

The Seeds of Strength project carried out by the International Maize and Wheat Improvement Center (CIMMYT) to identify and deliver **better suited wheat and maize cultivars** has started well, with 300 tonnes of seed of an improved wheat variety imported and distributed to 9000 farmers in four provinces. Fertiliser has also been imported and distributed. Thirty-five wheat variety trials were conducted at six sites, and 24 trials were conducted with open pollinated maize varieties. The project has initially been funded by AusAID for two years beginning July 2002.



*Inspecting crops*



*Afghanistan crops*



*Afghani establishing crops*



Bangladeshi members of the ACIAR scientific team at work in the field

# Bangladesh

Active projects in 2002–03	4
Bilateral country expenditure in 2002–03	\$368 485
Bilateral country expenditure in 2001–02	\$310 423
Bilateral country expenditure in 2000–01	\$449 768

## Position

ACIAR’s program in Bangladesh is small, given Australia’s relatively limited comparative advantage to deal with this country’s rice-dominated agricultural problems. Several projects deal with legume rotation crops in the rice farming system. Future ACIAR-supported initiatives in Bangladesh will be led by the Consultative Group on International Agricultural Research (CGIAR) centres. Donor collaboration is encouraged and a current ACIAR-funded project on analysis of the fate of arsenic from groundwater is the research component of a larger initiative on the arsenic problem in Bangladesh, which is funded by AusAID and several international donors.

## Achievements

Several vegetables commonly grown in Bangladesh, such as arum and aramantus, have been identified as accumulators of elevated concentrations of arsenic. The growing conditions under which this may occur have also been identified, allowing information to be disseminated to the local communities either to limit consumption or to carefully control conditions under which these crops are grown. Project researchers also identified that the concentration of **arsenic in rice** varies with the species, with many species accumulating less arsenic than the maximum acceptable concentration defined by Australian Food guidelines. However, the amount of rice ingested by Bangladeshis ranges from 500 to 800 grams per meal, which leads to the intake of the maximum recommended level of arsenic being exceeded.

An ICARDA-led project focused on disease resistance and integrated **disease management for faba beans, chickpeas and lentils** has combined resistant genes from various sources to develop lines with high levels of resistance to chocolate spot. New sources of resistance to chickpea *Ascochyta* blight and *Fusarium* wilt as well as new sources of resistance to lentil wilt were confirmed. Combined resistance to *Ascochyta* blight, certain viruses and chocolate spot in faba bean and to *Ascochyta* blight and vascular wilt in chickpea were also identified. Major advances were made in the detection of the causal agent of a faba bean root rot. Testing to improve integrated disease management packages to control chickpea *Ascochyta* blight in farmers’ fields demonstrated a yield increase of 2.5 to 3.0 tonnes per hectare.



# Bhutan

Active projects in 2002–03	1
Bilateral country expenditure in 2002–03	\$44 145
Bilateral country expenditure in 2001–02	\$67 575
Bilateral country expenditure in 2000–01	\$140 798

## Position

ACIAR's small program with Bhutan began in 1998. Because of Australia's relatively low comparative advantage, the program will remain very small, with a current focus on pest and disease management.

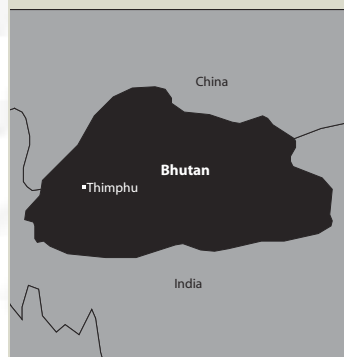
## Achievements

**Footrot**, caused by the endemic strain *Dichelobacter nodosus*, has been **eliminated** from the national breeding and distribution flock **through delivery of a specific vaccine**. The vaccine targeted the only strain of *D. nodosus* identified in Bhutan. A national survey established that footrot was widely distributed throughout the districts of Bhutan, with its incidence correlated to the receipt of sheep from the national breeding centre.

A survey of fruit fly species to determine which cause **crop losses of citrus fruit** has identified a single species responsible for the majority of these losses. Three other species that have a lesser impact were also identified. Management options, both against the dominant species and also for fruit, based on the breeding cycle of the fly, have been developed and are being trialled. These include the use of bait sprays and other options over a two-month period that coincides with the sexual maturation of female flies, using locally available substances.



Bhutan fields



# Nepal

Active projects in 2002–03	3
Bilateral country expenditure in 2002–03	\$188 503
Bilateral country expenditure in 2001–02	\$175 304
Bilateral country expenditure in 2000–01	\$11 778

## Position

Almost 85 per cent of Nepal's population live in rural areas and the majority of these are involved in agriculture. ACIAR has had a small program of projects in Nepal, with an emphasis on crop production and management, and some aspects of animal health in the lowland Terai, which has most in common with Australian environments. ACIAR-funded research has made progress in the fields of crop and livestock health and productivity and land management.

## Achievements

Useful resistance to the wilt-root disease syndrome has been defined in nine lentil selections, representing a significant improvement in the resistance level of current Nepali and Australian cultivars. A mapping exercise has defined the extensive range of acid soils where a combination of rhizobial strain with best adapted genotypes can boost **lentil production**. Research into seed priming technology has resulted in the Nepal Agricultural Research Council framing a recommendation for its use by growers, following yield increases in some trials of up to 43 per cent.



*Livestock keeping in Nepal*



*Nepal*



*Project leaders meeting in Nepal*

# Sri Lanka

Active projects in 2002–03	4
Bilateral country expenditure in 2002–03	\$382 480
Bilateral country expenditure in 2001–02	\$159 417
Bilateral country expenditure in 2000–01	\$157 111

## Position

Sri Lanka was an original partner of ACIAR's; the high quality of training of many Sri Lankan agricultural scientists and their excellent English facilitated development of the program. Most collaboration has been in animal sciences, especially animal health. Other areas have included fisheries, farming systems economics, agricultural development policy, crop sciences, forestry and crop postharvest technology. Several past project outputs are being used in new Asian Development Bank-funded projects. ACIAR maintains a small program in Sri Lanka. On occasions, ACIAR supports Sri Lankan scientists as specialist advisers to assist in projects in the region.

## Achievements

ACIAR is supporting research on **enhancement of disease resistance** and loss reduction **in mangoes and bananas** in Sri Lanka. In Sri Lanka, preliminary investigations of disease resistance in banana fruit have documented cultivar differences in phytoalexin production and tissue acidity. Studies on mango found the same preformed defence compound in nine local cultivars. In Australia, research has commenced on treatments which enhance the natural defence mechanisms in mangoes.



First harvest from a project-supported small reservoir in north-central Sri Lanka



Sri Lanka pond harvest

